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THE TREATMENT OF PUERPERAL INFECTION— PREVENTIVE AND CURATIVE.

BY

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I hope the members present will pardon the selection of a well worn subject, but it was suggested to me by the admission, into the Gynæcological ward of the Montreal General Hospital while under my care, in one week, of three patients suffering from the effects of puerperal infection, and also by one or two papers upon the subject which have recently appeared in the *British Medical Journal*.

Since the discovery by Semmelweiss of Vienna in 1847 that "Puerperal Fever" (as it was then, and still is by some, ambiguously called) was due to infection, physicians have been searching for some method of prevention and cure. Although the world owes him a deep debt of gratitude for leading investigations into the cause of this disease into the proper channel, Semmelweiss suffered the fate of many others of the world's benefactors,—dying unknown and in want. He endeavoured to prevent the infection by the use of chlorine in the form of chlorinated lime for his hands, instruments, etc., as did also Simpson, and it may be interesting to quote from the latter's lectures delivered and published a little later. He divided the treatment into prophylactic and curative, as follows:

"*Prophylactic.*"

1. Preparatory dieting, medicine, etc: The use of quinine, arsenic, perchloride of iron, etc.
2. Best possible air and ventilation.
3. Avoidance of contagion and inoculation. Use of chloride of lime, cyanide of potassium, etc., to disinfect the fingers of the *accoucher*.

Curative.

1. Venesection?
2. Leeches.
3. Fomentations.
4. Rapid counter-irritation, as by turpentine or blisters.
5. Enema or purgatives.
6. Opium with calomel.

¹ Read before the Franklin County (Vermont) Medical Society, May 11th, 1897.

7. Ipecacuanha or tartrate of antimony.
8. Turpentine internally.
9. Colchicum, veratrum viride, digitalis, stimulants and tonics.
10. Washing out the uterus."

The above includes the whole lecture upon the treatment, and, as you see, Sir James was decidedly brief.

The use of antiseptics in midwifery was not placed upon a scientific basis until the advent of Lister revolutionised the whole of surgical technique. It is difficult for us to realise the benefits conferred upon humanity by this man, whom the whole medical, and to some extent the lay, world is at the present time deservedly honouring. His name is one well worthy of a foremost place in the list of the greatest benefactors of the human race, and to rank with Galen, Harvey, Jenner, Morton, Simpson, and Pasteur.

In 1870, Bischoff and Stadfeldt began the use of carbolic acid in midwifery, obtaining marvellous results by so doing. Tarnier replaced this by corrosive sublimate in 1881, but its use was not generally adopted by the profession at large until later.

As proof of the use of Listerism in midwifery, allow me to give you a few statistics which are decidedly instructive if somewhat dry.

In the New York Maternity Hospital from 1875-1883, a period previous to the adoption of a strict antiseptic technique, 3,504 women were delivered with a mortality from puerperal septicæmia of 146; in other words 4.17 p. c.; 1 in 24 or 41.66 in 1000. During the last three months of 1883, however, corrosive sublimate was used in 102 confinements without one death from any cause whatever. This is too small a number of births from which to draw any conclusions as the good results may have been more from good luck than good management, but the following results obtained under strict antiseptic principles will negative any such suspicion. From 1884 to 1893, in this same institution, there were 3,789 deliveries, with seven deaths from sepsis, *i.e.*, .18 p. c. or 1 in 541.28, or 1.84 in 1000, and during the last three years of this period 1,059 confinements occurred without one death from sepsis.

What a difference these figures show! Without antiseptics 41.66 women died from sepsis out of every 1,000 deliveries, while with strict antiseptics the mortality was reduced to 1.84 per 1,000.

The writer of the article from which the above was quoted states that in New York or other large cities 1.12 per cent. or 11.2 women die from puerperal sepsis out of every 1,000 deliveries in private practice, thus showing that it is safer in such cities to be confined in a maternity hospital than in one's own house. It is hardly fair, how-

ever to make any comparison between the results obtained in a well conducted institution, where the patient has everything which can conduce to a safe confinement, with general private practice, as here there must be a large percentage of women confined either by no one at all or else by some ignorant midwife and whose surroundings render antiseptics almost an impossibility. If it occurs among the well-to-do, who can command the services of a skilled *accoucheur*, it is very seldom that it cannot be traced to the carelessness of either the doctor or nurse.

Let us turn, now, for a moment to some English and Canadian statistics. At the London General Lying-in-Hospital, antiseptics were not systematically employed until 1880. For the forty-five years previous to that, 9,606 deliveries took place with 244 deaths from sepsis, *i. e.*, 1 in 39.36 or 25.4 per 1,000. Between 1880 and 1887, carbolic acid, potassium permanganate and corrosive sublimate were successively employed with the result that 2,585 deliveries occurred with but 16 septic deaths, *i. e.*, 1 in 161.56 or 6.14 per 1,000. Corrosive sublimate was the only antiseptic employed from 1884 to 1889, during which time there were 2,150 deliveries with but 9 septic deaths, *i. e.*, 1 in 238.88 or 4.18 per 1,000.

Next, we will take up the city of London Lying-in Hospital. In this institution in the years from 1870 to July 1st, 1886, no antiseptics were used, and the deaths from sepsis varied from 1 in 24 to 1 in 287, and, except in 1879 and 1881, when they were 1 in 287 and 1 in 104½ respectively, the maximum and minimum were 1 in 24 and 1 in 50; truly a most appalling record!

Sublimate began to be systematically employed on July 1st, 1886, and during the next 10½ years, *i. e.*, up to Dec. 31st, 1896, there were 4,608 deliveries followed by only 11 deaths from sepsis, *i. e.*, 1 in 419 or 2.387 per 1,000. Of this period, from Jan. 1st, 1892 to Dec. 31st, 1896, there was not one death from sepsis although 2,392 confinements took place, *i. e.*, septic mortality fell from 1 in 24 in 1870 to nil in 1896.

Healthy surroundings, apart from the use of antiseptics, will do but little to stave off this disease, as was shown in the case of the above mentioned hospital, it having been placed in the best sanitary condition possible with almost no effect before strict Listerism was adopted.

While we cannot go back very far in Canada, it may be of interest to note the statistics from the only two provinces from which they were available, *viz.*, Ontario and Quebec.

Ontario, 1894—In the whole province, 42,051 deliveries were followed by 19 deaths from sepsis, *i. e.* 1 in 2,213.21 or .45 per 1,000.

In the City of Toronto, 4,201 deliveries resulted in 3 deaths from sepsis, *i. e.* 1 in 1,400.36 or '71 per 1,000.

Hamilton had a septic mortality of 1 out of 1,028 deliveries or .97 per 1,000.

1895—In the whole province, 41,628 deliveries resulted in 22 septic deaths, *i. e.* 1 in 1,892.18 or .52 per 1,000.

During the same year, Toronto's mortality from sepsis following confinement was 4 in 4,131 births, *i. e.* 1 in 1,032.75 or '96 per 1,000.

Quebec, 1894—Here the mortality was as follows:

Whole Province—Births 53,495, deaths from sepsis 87, *i. e.* 1 in 614.88 or 1.62 per 1,000.

Exclusive of the three cities, Montreal, Quebec and Three Rivers.

Births 43,346, deaths from sepsis 49, *i. e.*.....1 in 884.61 or 1·13 in 1,000.

City of Montreal " " "1 in 216.13 or 4'62 in 1,000.
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City of Quebec " " "1 in 1,583 or '631 in 1,000.
City of Three Rivers—Births 343, deaths from sepsis 0.

1895.

Whole Province—Births 58,650, deaths from sepsis 168 *i. e.* 1 in 349.10 or 2.86 per 1,000.

Excluding three cities.

Births 47,247, deaths from sepsis.....120 *i. e.* 1 in 393.72 or 2.53 in 1,000.

City of Montreal—Births 8,596, deaths from sepsis. 42 " 1 in 204.63 or 4.88 in 1,000.

City of Quebec	"	2,454,	"	"	"	5	"	1 in 490.80 or 2'03 in 1,000.
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City of Three Rivers "	353,	"	"	"	1 " or 2'83 in 1,000.
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It will be noticed that the city of Montreal has a comparatively high mortality from puerperal sepsis, but that, I think, can be accounted for in two ways.

The system of registration of births is not so complete among those not belonging to the Roman Catholic church, while that of the deaths is the same all through the province, irrespective of religion, so that, while all deaths from puerperal sepsis are recorded, many births, especially among the Protestants, are not, thus giving a higher percentage of deaths to births than actually exists. It follows that in districts containing the largest percentage of Roman Catholics the statistics will be the most accurate. From these facts, it will be seen that Montreal, having a larger percentage of non-Roman Catholic inhabitants than either of the cities of Quebec or Three Rivers or the rest of the province, will record all deaths from puerperal septicæmia while probably more births go unrecorded than elsewhere in the province, thus showing a higher mortality in child-birth than in other districts where births and deaths are equally recorded. Another reason is that many cases which originate in the country districts are sent into the city for treatment at one of the city hospitals. In the "Woman's Hospital," under the care of Prof. H. Reddy, there have been three deaths from puerperal septicæmia in the last

600 odd deliveries. This is a large death-rate, but all three occurred within one week in 1895, and Dr. Reddy thinks that the infection was directly communicated from the first case to the next two, the cubic space in the ward being insufficient.

Notwithstanding the proved efficacy of antiseptics in midwifery, there is little doubt but that they are not as regularly and thoroughly employed as they should be. Some practitioners do actual harm by their antiseptics as they use such weak solutions that they are inefficient, yet they believe so implicitly in them that they neglect the ordinary precautions of cleanliness. I have even heard a man, who was supposed to be a well educated physician, state in a medical society that he was not a great believer in the use of antiseptics during labour; that he very rarely employed them, and that he even did not always take the precaution of washing his hands previous to examining a parturient woman. That man must either be very fortunate or else have an appalling septic mortality. Many say that in the country antiseptics are not so necessary as in town, as the pure country air banishes the risk of infection, but is that really the case? Most emphatically no! It lessens, but by no means banishes the risk. Its effect is negatived to a great extent by the disadvantages under which the country practitioner works. For example, he has just opened an abscess containing very virulent streptococci, is ten miles from home, and is called hurriedly away to attend a woman in her confinement. He has no time to go home and change his coat and shirt, but has to proceed at once, perhaps, to apply forceps. I fear that all the pure country air in existence would not prevent that patient becoming septic unless it was assisted by thorough use of soap and water and antiseptics, although there is no doubt but that it would mitigate the effects of the infection.

It having been proved by both popular and scientific observation that women who are in a good state of health are less liable to suffer or if infected, to die from puerperal infection, it behoves us to get our patient into as good a condition as possible before confinement.

I have endeavoured to show, by the above statistics, both the utility of antiseptics and also the extent to which puerperal septicaemia prevails at the present day, and hope that you all will agree with me that the strictest antiseptics is absolutely necessary in conducting labour and that the death-rate from infection should be still lower than it is.

Let us now consider both what antiseptic to use and how to employ it so as to best prevent the occurrence of puerperal infection. For the purpose of rendering the hands of doctor and nurse aseptic, carbolic

acid (1-40), corrosive sublimate (1-2000), potassium permanganate followed by oxalic acid (saturated solutions of each) and creoline are most often employed and are about equally efficacious, but all must be used thoroughly to be of any service whatever, and that too after well scrubbing the hands and forearms with a nail-brush and soap and water.

Personally, I prefer sublimate as it is very efficacious and convenient, but if you have been attending any septic cases, the potassium permanganate is better and the manner in which it is employed by Professor H. Reddy at the Women's Hospital is very good. The rules, which he advises the *accoucheur*, students and nurses to employ are as follows:

1. Scrub the hands and forearms with salicylic soft soap, nail-brush and water for five minutes by the clock.
2. Soak the hands in a strong solution of potassium permanganate until they are stained a mahogany brown.
3. Decolorise with a solution of oxalic acid.
4. Rinse off the acid in corrosive sublimate solution (1-2000) or creoline.

By careful attention to the above rules, you will render your hands perfectly aseptic, as I have proved upon several occasions by taking cultures from my own hands and those of my assistants before and after using the pot: permanganate, etc. those taken before being invariably septic while those taken after it have been sterile.

No matter what kind of antiseptic one employs, it is absolutely necessary to thoroughly use the nail-brush with soap and hot water as a preliminary, as not only do you remove a certain number of germs thereby but you also soften the skin and give the germicide a much better chance to act upon the deeper layers of the cuticle.

In some cases, the patient will be suffering from some infective discharge, such as gonorrhœa, and where you suspect such to be the case, you will find it to be of service to give a preliminary vaginal douche of sublimate (1-3000) or creolin, but this should be avoided unless there is some special indication for its use, as it removes the vaginal mucus which serves as a lubricant of the passages and also as a germicide.

This latter fact is one of the strongest arguments against the routine use of antiseptic douches after labour, the healthy vaginal discharge being quite capable of overcoming a large number of bacteria. These cannot be removed from the deeper layers of the mucosa by the douche although the natural germicide, i.e. the discharge, is and therefore the patient is deprived of its protecting in-

fluence, thus being much more liable to infection. These remarks only refer to the routine use of the douche.

Where instruments are used, the hand inserted into the uterus or a dead foetus is present, an intra-uterine douche of sublimate (1-4000) followed by boiled water will usually prevent any septic trouble, but otherwise no vaginal or intra-uterine douche should be given during the puerperium if everything is progressing favourably.

As an additional safeguard, we should, if possible, choose the room in which the patient is to be confined. In addition to its being light and airy, it should be as far off as possible from any water closet and ought not to contain any fixed-in basins, or, if these are present, they ought to be closely covered up, as one can never tell when the traps may become defective. That this is not an imaginary danger is clearly demonstrated in Playfair's "Science and Practice of Midwifery," where cases are quoted of infection by sewer-gas, and diagrams shown illustrating the way in which currents of air conveying infection passed. Cases where the infection has been traced to a defective drain and where recovery has followed the removal of the patient to another house or room, are now and then reported in medical papers.

Having considered the prevention of infection, let us now proceed to the methods employed to cure a case, once infection has occurred.

The number of the methods of treating this malady shows only too clearly that no specific has yet been discovered, not even the much talked of antistreptococcus serum.

One of the most important factors in the question is the early diagnosis of the case. To begin with, in all cases where you have the onset of the symptoms of puerperal septicæmia appearing, the parts should be carefully examined and any lacerations thoroughly cleansed and repaired to prevent further absorption from taking place through them. The interior of the uterus should likewise be carefully examined for the presence of retained products of conception, and, if found, they should be removed. The safest instrument with which to effect the removal is the finger, or, if this fails, the dull wire curette. A sharp curette may be used, but not unless the operator has had a great deal of experience with this instrument, as, unless one is very careful, it is liable to remove uterine substance.

At this point, I hope that I may be permitted to make a short digression from actual treatment in order to urge the importance of not placing too much reliance upon the temperature in diagnosing septic infection, no matter whether it be puerperal or not. The pulse will be found to be a much safer guide, as, while you almost never will see a case of

sepsis without a quickened pulse, you will not rarely run across cases in which there is almost no noticeable rise in temperature, I, myself, having seen several cases in which the temperature did not rise over 99.5° F. Where you have a rapid pulse, headache, foul tongue and a dry, hot skin in a puerperal woman look out for septic infection, no matter what the temperature indicates.

In the majority of cases where the patient develops a slight chill with rapid pulse, and possibly some rise in temperature on the 4th or 5th day after labour, an intra-uterine douche of sublimate (1-3000) will usually rapidly check the process. If the first one does not do so, it is well to repeat it in five or six hours, when thoroughly swabbing out the uterus with either pure carbolic acid or else iodized phenol in addition will often have marvellously beneficial results.

If the case is more severe, especially if the cervix and vagina are covered with false membrane, thorough curettage of the uterus and also even of the vagina is indicated and may require to be repeated as it is exceedingly difficult to get the curette up to the orifices of the Fallopian tubes. For this reason it is well to use a very small curette. This operation ought to be followed by a copious douche (intra-uterine) of sublimate (1-3000), which should be succeeded by one of boiled water, after which, the cavity should be carefully dried and then swabbed out with either pure carbolic acid or iodized phenol.

A word now in regard to sublimate douching. Many are afraid to use it, in case they cause sublimate poisoning. While not denying that this does occasionally occur, especially in blondes, the sublimate douche, when properly given, seldom is followed by any ill results.

Personally, when the intra-uterine douche is indicated, sublimate is what I always employ in a strength of 1-3000 both in public and private, and I have never yet seen any harmful effect follow, but great care is always taken to have a free exit for the fluid from the uterine cavity and the last drops are expelled by expression.

In the City of London Lying-in Hospital, Clement Godson uses sublimate entirely, using 1-1000 for the hands and 1-2000 for vaginal irrigation. He gives a 1-2000 vaginal douche at 115°F., immediately after delivery of the placenta and repeats it three times with an interval of twelve hours between each, after which he replaces the sublimate with iodine. This method has been employed in over 4,500 deliveries without any sign of mercurial poisoning. Another British writer, Sharp, says that, "in a really serious septic case, corrosive sublimate is the only reliable antiseptic and should be used fearlessly in a strength of 1-2000." This, however, I think is too strong a solution,

as such a powerful one would destroy the tissues and so furnish pabulum for the germs.

In addition to local treatment, the patient's general condition will require attention. Her strength must be maintained by nourishing but easily digested food, such as milk, eggs, soups, juice expressed from beef, which has just been warmed through, etc. Stimulants are usually necessary, good brandy, whiskey or port, being the most serviceable of the alcoholic ones and strychnine of the truly medicinal ones, giving gr. $\frac{1}{40}$ - $\frac{1}{30}$ every 4, 6 or 8 hours, as the urgency of the case requires. The spirits may be beaten up with egg and milk once or twice daily, if the patient can stand these latter, in addition to taking them in water at whatever intervals are indicated.

The bowels and other emunctories should be kept active, and hot applications to the abdomen, especially turpentine stupes, are of great service in relieving the pain. For this latter purpose, Battley's solution is very useful, it acting somewhat as a stimulant in addition to its sedative properties.

It is not advisable to give antipyretics continuously, as they simply obscure the symptoms, but eight or ten grains of quinine may be given now and then if the temperature keeps up too high.

Serum therapy in the treatment of puerperal septicæmia has been receiving considerable attention of late and numerous cures by it have been reported, but Marmorek's antistreptococcus serum is still on its trial, and, I fear, will not turn out to be such a success as was at first hoped. In nearly all of the successful cases in which it has been used, the general and local treatment above recorded has been employed, which utterly negatives the results as far as testing the value of the serum is concerned. Certainly a few cases have been reported where its administration has been followed by rapid amelioration of the symptoms, although the older treatment had been thoroughly employed with no effect, so that there is no doubt but that it is sometimes of benefit. It must be remembered, however, that the majority of mild cases, if taken in hand early, get well under intra-uterine douching, and that many of the severer ones can be cured by curetting combined with the application of caustics and douching, while other cases, apparently no more severe, will result fatally, no matter what we do. The dose of the serum varies, rapid improvement having followed the injection of 3 c.cm., while 20 c. cm. have been used in other cases with absolutely no result. The dose ordinarily employed seems to be 10 c. cm. injected under the skin of the abdomen and repeated every six or eight hours, if required. When successful, an almost immediate fall of temperature and pulse

rate follow. The only complication which has been recorded is the occurrence occasionally of a bullous eruption near the seat of injection. Whether one uses the serum or not, it is absolutely necessary that he should not neglect to employ the older treatment in addition.

Personally, I have only used it in two cases and could not see that the slightest benefit resulted. The first case, however, can scarcely be considered to be a fair test, as the patient was first seen in consultation five days after the onset of the symptoms of infection. At this time there was nothing abnormal to be made out in the pelvis or abdomen, the doctor in charge having douched the uterus several times with a solution of 1-4000 of sublimate. Septic pneumonia was present, the base of the left lung being involved. The patient received three injections of 10 c. c.m. each, within thirty-six hours, but died neither the pulse nor temperature being influenced by the serum.

The second patient was brought into the gynaecological ward in the Montreal General Hospital nearly four months ago, signs of infection having shown themselves nearly one week previously. There were some small lacerations of the vagina, this organ, together with the cervix and interior of the uterus being covered by a greyish false membrane, a culture from which gave streptococci. The lacerations were thoroughly cleansed and repaired, the uterus and vagina were curetted, douched with one gallon of sublimate solution (1-3000), well swabbed with pure carbolic acid and lightly packed with iodoform gauze. Douching and packing were repeated twice daily for several days. On the second day, as there was not very marked improvement in the pulse and temperature, an injection of 10 c. c.m. of antistreptococcus serum was administered and, in order to be brief I will just say, was repeated every twelve hours during the next six days, 20 instead of 10 c. c.m. being twice given. After a day or two the temperature and pulse rate began to come down and would fall to nearly normal and then shoot up again during the night to between 102 and 103° F. The serum was discontinued and the temperature has continued to rise and fall almost daily ever since, but latterly it has remained down for perhaps two continuous days under the influence of five grains of quinine. Two abscesses, probably pyæmic, have developed in one arm and the left hip-joint appears to be affected. The patient's strength is keeping up well and she is slowly recovering.

From an analysis of the cases fully reported where it has been employed, the serum appears to give excellent results where cultures prove the presence of streptococci alone, but, where the infection is mixed, it is of but little use.

As regards operations for relief of the condition, I may say that curetting is the only one to be recommended although of course abscesses which develop should be opened. When a case is sufficiently severe to indicate hysterectomy, it is too late to operate, and, as so many cases get well after less heroic methods of treatment, I don't think that we are justified in removing the uterus, which in itself is a grave undertaking. If, however, you find that the uterus is greatly lacerated, inviting the absorption of infection as it were, the question of hysterectomy may be considered.